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The banana and its cultivation with special reference to the British Empire

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Institute, have been supplied to the Uganda Section of the British Empire Exhibition :

Glazed earthenware. Test piece made from a mixture of the blue and white clays with flint and felspar.

Unglazed earthenware tile. Test piece made from a mixture of the blue and white clays with flint and felspar.

Glazed earthenware tile. Test piece made from a mixture of the blue and white clays with flint and felspar.

Stoneware. Test pieces made respectively from (*a*) a mixture of the white clay with flint and felspar, and (*b*) a mixture of the blue and white clays with flint and felspar. Both specimens covered with a felspathic glaze.

ARTICLES

THE BANANA AND ITS CULTIVATION, WITH SPECIAL REFERENCE TO THE BRITISH EMPIRE

Among the many fruits which are native to or are cultivated in the tropics, the banana takes a leading place both as regards its local uses as a native foodstuff and its importance in overseas trade. Its high standing as an article of export is due to several factors ; the plant is easily grown and gives an early return ; it is prolific, and a crop can usually be assured ; the fruit travels well in cold storage and arrives in a presentable condition in countries far distant from its place of origin ; its easily removable skin protects the edible portion from contamination during handling ; it can be retailed at a low price and, besides being eaten as a raw fruit, it can be employed as a food in many other forms.

The trade in bananas is a highly organised one and much capital has been sunk in developing it to its present large dimensions. The first importation of bananas into the United States took place in the late sixties, but it was not until the formation of the United Fruit Company in 1899 that the industry became important. Small importations into the United Kingdom were made from Madeira in 1878 and from the Canary Islands about 1882, but shipments in special steamers were not made until 1901. At first bananas were a luxury and, as they were expensive, the demand for them was small and confined to a few classes. The key to the success which has attended the banana industry was found to be small profits on a large scale, and these were obtained by keeping the price within the means of the poorest, thereby creating a large aggregate demand from numerous consumers.

Some idea of the present dimensions of the trade may be gathered from the following tables which give the imports from the principal producing countries into the United States of America and the United Kingdom, which are the principal markets for bananas in northern temperate regions.

Imports of Bananas into the United States

Countries of Origin.	1913*	1919.	1920.	1921.	1922.
	bunches.	*bunches.*	*bunches.*	*bunches.*	*bunches.*
Costa Rica .	6,973,684	4,060,500	5,402,235	3,998,930	3,704,727
Guatemala .	2,359,250	2,445,020	3,634,367	4,385,000	4,498,800
Honduras . .	7,983,591	11,359,578	11,488,418	13,173,225	14,584,674
Nicaragua . .	1,681,944	847,906	1,338,757	1,931,248	2,603,491
Panama . .	4,438,300	4,899,027	4,558,947	3,976,602	3,665,378
Mexico . .	1,541,504	175,411	728,405	1,428,687	739,186
Cuba . .	2,213,733	1,515,832	1,697,020	1,774,161	1,808,872
Colombia . .	2,684,749	4,094,940	2,679,154	3,515,236	2,205,538
British Honduras	651,064	681,430	583,462	457,026	460,825
British West Indies (chiefly Jamaica) .	11,164,894	6,912,779	7,143,128	8,687,005	10,689,186
Other Countries .	664,396	672	65,669	38,643	134,215
Total quantity, bunches . .	42,357,109	36,993,095	39,319,562	43,365,763	45,093,892
Total value $	14,484,258	15,934,590	19,087,927	19,385,174	19,145,911

* *For fiscal year ending June* 30, 1913.

Imports of Bananas into the United Kingdom

Countries of Origin.	1913.	1919.	1920.	1921.	1922.
	bunches.	*bunches.*	*bunches.*	*bunches.*	*bunches.*
Canary Islands . .	2,138,080	1,871,590	2,322,842	2,646,072	2,645,444
Republic of Honduras .	—	—	—	53,680	1,185,492
Costa Rica . .	2,614,186	—	168,939	1,439,938	1,228,059
Colombia . . .	2,255,504	255,692	3,374,634	3,925,788	4,163,695
Other Foreign Countries	32,451	533	762	51,469	3,507
Total Foreign Countries	7,040,221	2,127,815	5,867,177	8,116,947	9,226,197
British West Indies (chiefly Jamaica) .	499,763	2,768,844	2,190,448	1,384,618	1,804,963
Total quality, bunches.	7,539,984	4,896,659	8,057,625	9,501,565	11,031,160
Total value . £	2,172,688	3,908,393	6,468,719	6,553,016	5,315,109

It will be seen from the foregoing tables that the principal northern markets are supplied chiefly by Central American countries, Jamaica and the Canary Islands. The United States of America is the world's largest market, over 45 million bunches being imported in the year 1922, chiefly from Central America and the West Indies, more than half the total import being supplied by Honduras and Jamaica. The greater part of the United Kingdom supply is obtained from foreign countries, chiefly from Colombia and the Canary Islands, the only country in the Empire supplying appreciable quantities being Jamaica. The Australasian supply, outside the Australian production, is chiefly derived from Fiji and Netherlands East Indies (Java). The export from Fiji fluctuates considerably, but in 1920 was 759,830 bunches valued at £95,315, of which quantity New Zealand imported 460,339 bunches and Australia the remainder.

In view of the fact that the banana can be grown in most tropical lands where labour is available, and that several tropical countries in the Empire are closer to home markets than the Central American countries principally concerned with this trade, it would seem advisable to consider whether a greater share in the banana industry could not be undertaken within the Empire, more particularly in parts of West Africa which are within a comparatively short distance of the home markets.

THE BANANA PLANT

The plants which produce the banana fruits of commerce belong to the genus *Musa* of which several species are known. Only two species are, however, concerned in the banana fruit industry; these are *Musa sapientum* and *Musa Cavendishii*. To the former belongs the variety "Gros Michel," which is the principal kind grown in Central America and Jamaica.

This variety is a rapidly growing herbaceous perennial, attaining a height which varies according to the richness of the soil in which it is grown but may be as much as 40 ft., although the average in Jamaica is from 18 to 25 ft., and in Cuba 12 to 18 ft.

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It produces very large, rather straggling bunches of pointed fruits which are somewhat coarse as compared with the Canary Islands banana. They can, however, withstand a considerable amount of handling without damage, and as they can be exported without crates they are the most popular for market purposes. There is a coloured form of this variety known as the " red " or " claret " banana for which there is a comparatively small demand.

Musa Cavendishii, or *M. sinensis*, commonly known as the Chinese, Cavendish, Dwarf or Canary Islands banana, is native to Southern China whence it has been introduced to the Canary Islands and to many countries in the East and elsewhere. The plant is much smaller in all respects than the "Gros Michel," attaining a height of only 10 to 12 ft., and this, together with its robust habit, renders it more capable of withstanding violent winds and hurricanes; it is, in consequence, adapted to cultivation in countries where these are likely to occur. Its fruit is much smaller not only as regards size of bunch but also in respect of the individual fruits, which are short and not so pointed as the " Gros Michel " ; when mature they are deep golden-yellow, the flesh is " melting," aromatic, and of finer flavour than those of " Gros Michel," but the skin being more delicate is liable to injury during transport and for this reason the bunches are always exported in crates.

The apparent stem of the banana plant really consists of the basal portions of the leaf-stalks which overlap so as to form a protective sheath to the young leaves which develop within, and also serve in the place of a woody stem to support them. Distinct leaf-stalks are formed above the sheathing bases which constitute the stem, and these support the large curving leaf-blades, or fronds, which are often of great size, attaining a length of up to 8 to 12 ft. and a breadth of up to 2 ft. The real stem of the plant is a thickened underground root-stock, usually called the " bulb," from which the leaves and flower-spike spring and which gives rise to buds or " eyes " from which new plants are formed. As many buds or " eyes " arise from each root-stock a small colony of plants would originate from a single base if they were all allowed to develop, and each in time would form a root-stock of its own.

Plate VI.—Banana Plant in Fruit in Jamaica.

Showing " sword sucker " close to stem to the left and " follower " to right.

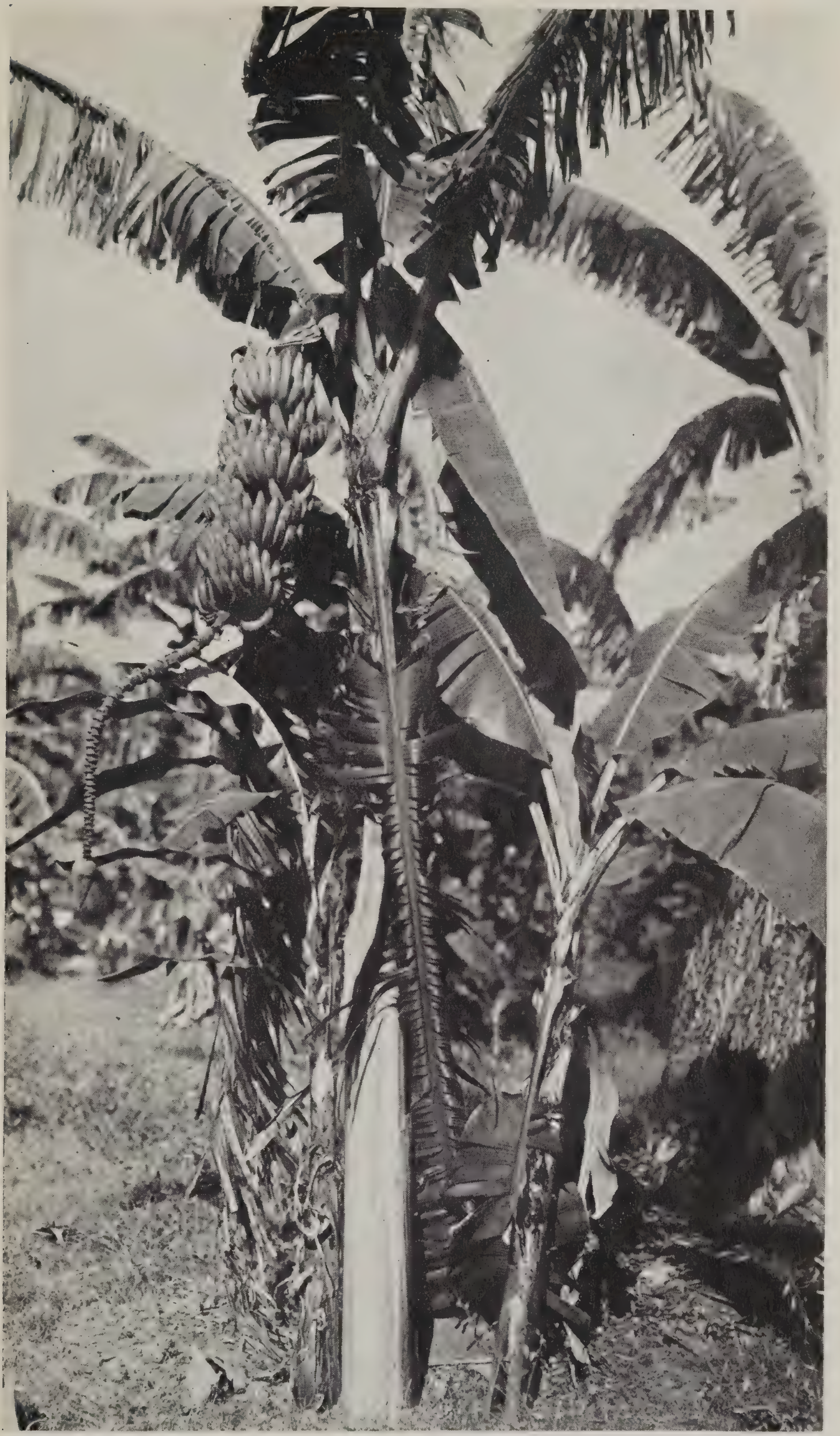

Photo by E. Wells Elliott, Kingston, Jamaica.

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PLATE VII.—MATURE BANANA PLANTATION IN JAMAICA.
View along a roadway between the blocks of bananas.

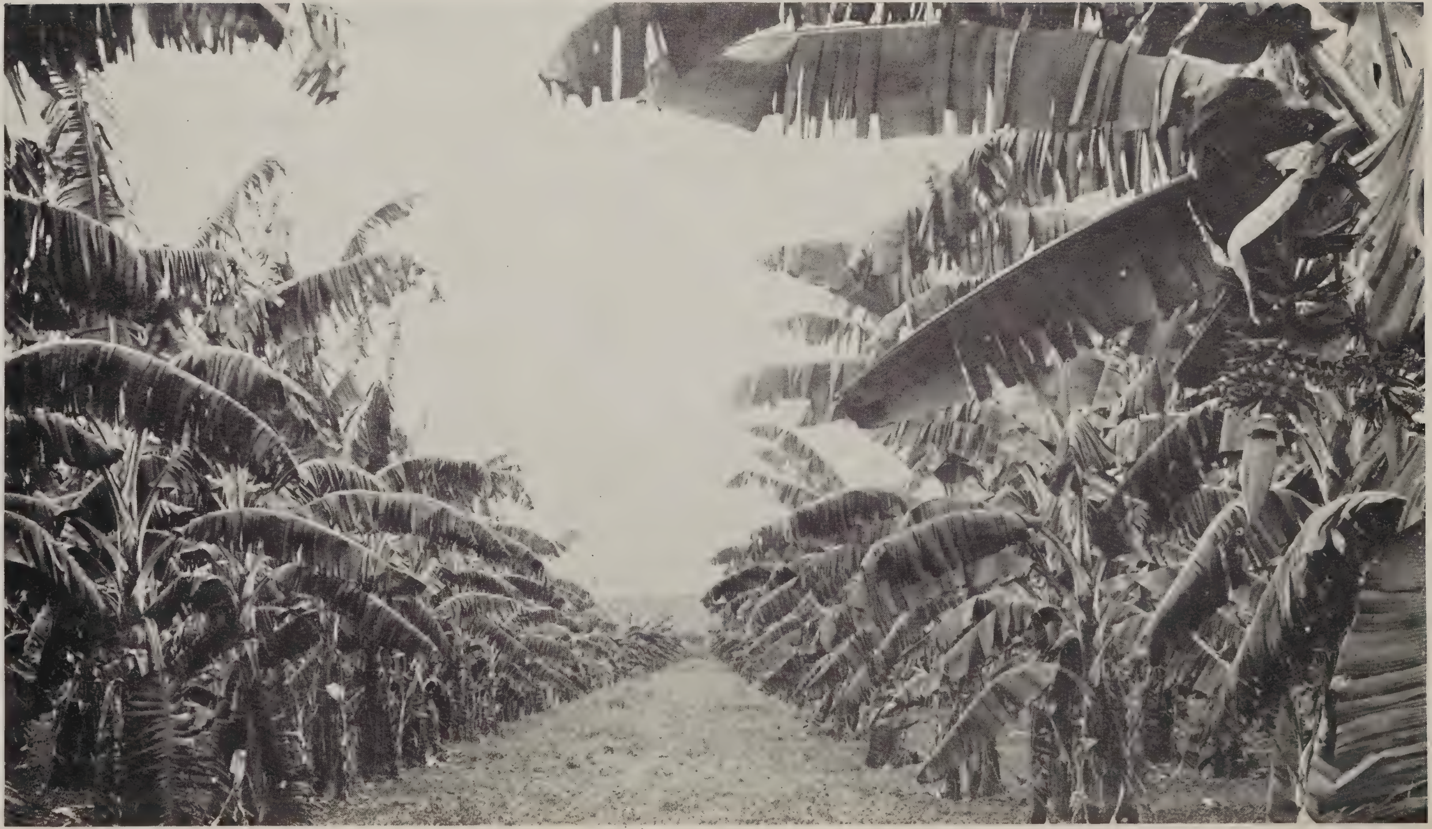

Photo by E. Wells Elliott, Kingston, Jamaica.

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When mature, the plant produces an inflorescence (flowering stalk) from the root-stock and this emerges from the centre of the tuft of leaves and ultimately becomes the bunch of bananas. The inflorescence is a terminal spike with flowers arranged spirally in clusters, each cluster protected by a coloured bract. The flowers are of different kinds ; those at the base are pistillate or female flowers and eventually develop into banana fruits ; those at the upper portion are staminate, or male flowers, which fall off, leaving scars on the bare stalks ; whilst a few intermediate ones are either hermaphrodite or neuter flowers, the former developing only small and useless fruits. The flower-spike is at first erect, but the weight of the flower-head causes it to bend over and eventually to point vertically downwards. The fruits which succeed the flowers are arranged spirally on the stalk in groups or " hands," each " hand " consisting of from 10 to 25 individual fruits or " fingers." The plant bears but a single bunch of fruit in its life cycle and this in the case of " Gros Michel " may be from 50 to 75 lb. in weight, composed of from 6 to 9 " hands," and is occasionally much larger. The Canary banana bunches usually carry from 125 to 250 fruits and weigh from about 25 to 65 lb. or more.

CLIMATE AND SOIL REQUIREMENTS

To produce the fruit to the best advantage a tropical climate, a rich alluvial soil, preferably river-bottom lands, and a considerable rainfall or means of artificial irrigation, are essential. Ideal conditions for banana cultivation are found in Central America where the mountain range which runs along the coast-line on the Pacific side gives off subsidiary ranges running eastward, leaving wide slopes, river valleys, and rich lowlands on the Caribbean Sea. In this locality, a few miles inland from the sea, at an elevation of not more than 250 ft., the rainfall is from 80 to 200 in. annually, and the hot days, succeeded by humid nights, provide the requisite conditions for the maximum growth of the banana. The plantations in this area are usually started in virgin land, for which purpose the forest growth is cleared and burnt off and the banana " bulbs " are planted at intervals in the cleared ground ; or the " bulbs " are planted first and the trees felled afterwards and allowed to decay on the ground. In Jamaica it has been found that bananas succeed on a wide range of soils, provided that drainage is satisfactory and tillage with modern implements is adopted. In the Canary Islands the soil is for the most part volcanic and is deficient in most plant constituents except potash. Although rich alluvial soils are selected for preference when these are available, the physical and mechanical conditions of the soil for bananas appears to be of more importance than its chemical composition ; even stiff clays, if well drained and cultivated, have been found to yield good results, whilst soils deficient in humus or decayed vegetable matter may be rendered suitable in this respect by green manuring and dressings of vegetable refuse. The first and most important thing to do in forming a banana plantation is to prepare the land thoroughly by deep ploughing and sub-soiling or preferably by trenching. Good drainage is absolutely essential for successful banana cultivation, drains being necessary on hillside slopes as well as in flat areas, where the soil is not naturally sandy or loamy. On hillsides the drains should run across the slope with only sufficient fall to carry off the water ; they should be at least 2 ft. deep, and should be made to discharge into horizontal catchments for collecting the débris and washed-out soil, which can be used as top-dressing when the catchments are cleared. In areas where the rainfall is insufficient artificial irrigation must be resorted to, and many excellent crops such as those in Colombia and in the Canary Islands are largely grown on irrigated land. The irrigation channels should be made close to the plants when they are young, but should later be made in the centre of the rows.

Propagation and Planting

The banana does not usually produce seed, and hence a vegetative method of propagation is employed when new plantations are formed. For this purpose the " suckers " or young plants which form at the base of the parent plant are used. These have narrow sword-shaped leaves when young and are then known as "sword-suckers." When about 8 months old they assume adult leaves and are then at the best stage for planting. They are cut down to within about 6 inches of the "bulb," the old roots are removed, and the heart eye is destroyed, as well as any others that may be present with the exception of one, the largest and fullest, which is retained to develop into the future plant. The "suckers" should be carefully lifted so as not to harm the bud, which is particularly liable to injury at the point where it is attached to the "bulb" or root-stock. The prepared suckers may be planted at once or they may be kept for a few weeks if stacked or protected from the sun by a covering of banana leaves or trash. If "sword-suckers" are used the leaves should be trimmed off and the side buds removed, the heart bud being retained in this case to develop into the future fruiting plant. In selecting suckers for planting, care should be taken to see that they are derived from clean stock, otherwise fungus or insect pests are liable to be introduced.

In Jamaica the "Gros Michel" banana suckers are planted in pits dug at least 1 ft. 6 in. deep, at a distance of not less than 12 ft. apart, but as much as 18 to 24 ft. between the plants is allowed in Central American countries where the soil is richer and growth more luxuriant. The Canary banana, being a smaller plant, is spaced about 10 ft. in planting, the distance depending upon the nature of the soil. The bulbs should be planted at a proper depth in the soil, the top of the "bulb" being not more than 6 in. or less than 3 in. below the surface of the soil when the pits are filled in.

The "hollow arch" portion of the sucker should be turned in the direction of the prevailing winds, especially in exposed districts where wind belts are not planted, as the leaves are then directed towards the wind and this gives the plant greater stability when fruiting. The earth removed from the hole made for planting should not be used for filling in ; the finer surface soil should be used for this purpose, but if found necessary to employ the original soil it should be left exposed to the action of sun and air for some time to sweeten before being used. The usual time required for the original plant suckers to fruit is 10 months after planting, or longer in some situations ; and from 2½ to 4 months are required to mature the fruit. It follows that at least 12 months must be allowed before a crop can be obtained. The best time for planting in order to secure crops early in the year is therefore in the autumn months or early spring.

Cultivation

The cultivation after planting varies according to the locality and rainfall. In dry areas it is essential to keep a surface mulch of dry soil by harrowing or hoeing in order that the evaporation of the soil moisture may be prevented. In certain districts a thick mulch of dry vegetable matter, such as grass or leaves, is employed for this purpose. In wet districts the principal operations are concerned with keeping down weeds by hand-weeding or forking between the rows, or by cutlassing if the growth is very dense. A green manure crop is sometimes grown and this is not only useful in keeping down weeds, but it provides a mulch and enriches the soil with the organic matter required by the banana crop, whilst at the same time it prevents soil wash. A leguminous crop should be used for this purpose, such as Jerusalem pea (*Phaseolus trinervis*), Bengal bean (*Mucuna utilis*) or cow peas (*Vigna Catjang*). The growth of the green manure crop should be cut down as soon as the plants begin to blossom and should be spread on the ground to rot, after which it may be forked into the soil. Ploughing or disc harrowing between the rows is also advisable at intervals up to the time of fruit development, as this not only helps to keep down weeds but tends to improve the soil conditions and renders more plant food available.

Pruning or Suckering

As previously mentioned, the banana plant throws out numerous suckers from the root-stock, and if all these were allowed to develop they would not only starve the parent plant but would crowd each other, and a poor crop of fruit would result. It is important, therefore, to thin out the suckers in such a way as to permit of the parent plant producing fruit of good size, and, at the same time, allow sufficient young plants to develop to provide suckers for replanting the land after the parent plants have fruited and been cut down. The pruning, or removal of superfluous suckers, is therefore an important operation, which should be carried out at an early stage when the sucker is not more than one or two feet high. The unwanted suckers should be cut away by means of a cutlass, the cut being made away from the parent plant so as not to injure the latter. The suckers must be cut away right down to the white, hard part of the root-stock, as if only the tops are removed they will soon spring up again.

In selecting suckers to remain for furnishing the plantation, their position and probable time of fruiting should be taken into consideration. Those which start from eyes placed low down are to be preferred as they have a good roothold in the soil. Pointed suckers with narrow leaves are usually the most vigorous and these should be selected where possible. A sucker developing on the "stump," or portion of plant that remains after the fruit has been harvested and the top cut down, should never be retained for refurnishing the plantation, as this develops into what is known as "water-sucker," a vigorous-growing plant which yields only a small bunch of fruit. Two or three suckers ("peepers") should be left round the base of each parent plant. Usually one of these takes the lead and this fruits in from 10 to 14 months, the other one or two fruiting 4 to 5 months later. The selection should therefore be made according to locality and length of time required for development with a view to obtaining fruit at the time of highest prices, which in the United Kingdom is from March to June.

"Ratoons" or suckers that develop in subsequent years after the fruit has been harvested from the parent sucker are spoken of as first, second or third year ratoons according to age. These may take from 21 to 25 months to mature a crop, and should therefore be selected at a suitable time to ensure fruiting during the spring months of the year.

The suckers or "followers" that arise along the row should be retained rather than those that develop between the rows as this tends to retain the original alignment and maintains space for the proper cultivation of the soil with horse or mechanical implements.

HARVESTING

As already stated (p. 309), in about 10 months or somewhat more from the time of planting the banana plant has "shot" or produced its flower stalk, and in a further 3 months the fruit is usually mature, the time varying with weather conditions. The harvesting of the fruit is done by cutting the trunk just below the bunch by means of a special knife attached to a pole. The weight of the bunch of fruit causes the top of the tree above the cut to bend over on one side, and in order to prevent it crashing and damaging the fruit, it is steadied by the pole until the bunch of fruit is within reach, when it is severed from the tree by means of a cutlass. In Central American countries a "gang" of three men usually work together to carry out these operations, but in Jamaica a "cutter" usually works alone.

After being cut the fruit is wrapped in the long dry leaves of the banana plant to prevent bruising and is conveyed as quickly as possible to a centre for classification and grading or direct to the wharf for shipping. The classes are based on the number of "hands" to each stem; in the case of the "Gros Michel" variety, these are known as "nines," "eights," "sevens" and "sixes"; and these are graded according to the fullness of the fruit, the grades being expressed as "thin" "three-quarter," "full three-quarter" and "full." Canary Island bananas are classed as "giants" with 250 or more fruits weighing about 65 lb.; "extras" with about 200 fruits, weighing 55 lb. or more; firsts with 160 fruits, weighing 45–50 lb.; and seconds with 125 fruits, weighing 25–40 lb.

In large, up-to-date plantations tram lines are laid throughout the plantations and these connect up with railways which in their turn convey the fruit to the steamer. Speed in transit from the plantation to the steamers is essential and many labour-saving mechanical appliances are employed to facilitate handling at the port and to avoid damaging the fruit. Inspection is necessary at each stage of the proceedings in order that all over-mature or defective bunches may be detected and eliminated.

To determine the exact degree of maturity required, in order that the fruit may arrive at its destination in the best possible condition, considerable judgment is necessary, and it is only by experience that this can be acquired. The degree of development at which the bunches are harvested depends upon their intended destination ; for example, bananas from Central America intended for the United States may be more fully matured than those intended for the United Kingdom market, as the sea journey to the States is much shorter.

After-Cultivation

When harvesting is completed, the old stumps or "yams" should be removed by "stumping" with a mattock before they rot, the holes made being filled in with good soil. A special curved, spade-like implement, called in certain states of Central America a "baraton," is sometimes used for this operation. The stumping should be done as soon as the sword-suckers selected as followers have attained a height of not less than 5 ft.

In good soil, with careful attention to suckering so as to keep up a supply of suitable plants for fruiting, and with the use of chemical fertilisers and natural manures, the plantations will last for a number of years, some of the plantations at Santa Marta in Colombia, for instance, being over 40 years old ; but eventually the ratoon plants will show signs of exhaustion and yield smaller bunches ; they are also liable to form "bulbs" above ground, and when this happens they are likely to be blown over in strong winds. The original alignment of the plantation also becomes lost after a number of years, and this makes cultivation difficult. In Jamaica it is found to be profitable to replant after the third or fourth ratoon crop has been harvested, that is, not later than the fifth year after the original plantation was formed. The replanting may be done between the old rows in the existing field if these are sufficiently wide apart, the suckers in the old rows being afterwards removed ; or the whole field may be cleared before being replanted.

In the latter case advantage should be taken of the clearing to plough and lime the land, and to raise a leguminous crop which should be fed off by grazing cattle before the replanting takes place, thereby enriching the soil with humus.

In order that the labour of replanting should not be too heavy in any one year, it is advisable to plant a certain area each year and adopt a system of replanting under which each area would be renewed in rotation every sixth year.

Packing and Transport

As previously stated, the "Gros Michel" bananas are shipped naked, each class of fruit being separately stowed on board. The bunches are stood on end, in tiers, in bins or compartments constructed of wooden bars, which prevent them from rolling and becoming crushed, whilst the spaces between the bunches allow of free air circulation. The Canary or Chinese bananas are packed in crates for shipping as they are liable to injury by handling. The hexagonal wooden crates usually employed for this purpose are first lined with straw or banana trash, and the bunch of fruit is wrapped in cotton wool and covered with paper, the latter being held in position while the bunch is being placed in the crate by strings made of strips of the leaf-sheath. After the bunch is in the crate it is firmly fixed by pressing in trash all round it, and when this has been done the strings holding the paper wrapping are cut and withdrawn, and the slats forming the top of the crate are nailed on. The quality of the bunch contained in the crate is indicated by marks on the outside; a bunch weighing from 40 to 49 lb. is marked "X"; one weighing 50 to 59 lb. is marked "XX"; one weighing 60 to 69 lb. "XXX," and extra sizes are specially indicated.

Specially designed steamers are employed in the banana trade, and these are not only fitted with refrigerating machinery to maintain a low and even temperature, but are provided with ample means for ventilation in order that the carbon dioxide and heat which the bananas give off whilst in storage may be removed. Before the bunches of bananas are placed on board it is usual to cool down the holds of the refrigerator ship for some 24 hours, and as soon as the ship is loaded the temperature is reduced to the required degree and is maintained as nearly as possible at this level during the voyage.

The unloading of a banana ship and the transference of the fruit to cold storage in banana warehouses to ripen is largely done by mechanical contrivances so as to avoid damage by handling and to shorten the time required. Specially constructed insulated railway trucks, that can be kept cool during hot weather and heated when it is cold, are employed for the distribution of the fruit to inland centres after being removed from the ship. At these centres the fruit is usually kept in cold storage until in a suitable condition for distribution to retailers.

Bananas need careful handling at all times, and will only travel safely when they are in an unripe condition. It is necessary therefore for the retailer to complete the ripening process, and for this purpose small special rooms are usually employed in which the fruit required for sale from day to day can be matured.

Fungus and Bacterial Diseases

Panama disease.—The most destructive of the several fungus diseases to which the "Gros Michel" banana is subject is that known as the "Panama disease" or "banana wilt." This disease has caused enormous losses in Cuba and in Central and South American countries, from Brazil to the United States border, except in the Santa Marta district of Colombia where the plants are grown under irrigation. It is also prevalent in the Philippines and in Jamaica and strict control measures have had to be enforced. The disease is attributed to a fungus, *Fusarium cubense,* which enters the plant at the root and gradually penetrates to the bulb, and later to the leaf stems. The presence of this fungus can be detected in the internal tissues of the "stem" and bulb by yellow, orange or red markings; and as its growth fills the vessels it stops the supply of water from the roots to the leaves. The diseased plants suddenly wilt, as if suffering from drought, and this is followed by rapid yellowing and subsequent browning of the leaves, which eventually fall against the stem. Finally the whole column falls and rots. In view of the serious nature of the disease, control measures should be adopted immediately the symptoms are detected and the affected plant should be dug up at once and destroyed by burning. The plants in the immediate neighbourhood of those affected should also be destroyed as, although they may appear healthy, the probability is that their roots are attacked, and it is better in any case to sacrifice them than to risk a spread of the disease. The soil in which the diseased plant was growing should be limed and the cleared area (for a distance of a chain all round) should be fenced off so as to completely isolate it, and no person should be allowed to enter the enclosure, as the disease is capable of being spread by soil adhering to workers' boots. Every part of the diseased plant should be burnt on the spot and should not be removed to other parts of the plantation, and all tools employed in cutting up diseased plants should be sterilised by heating, and workers hands, feet and clothes should be disinfected. A recent Government order in Jamaica requires that all banana trash employed in wrapping or packing bananas shall be destroyed by burning and shall not be removed from the various collecting centres, as mulching with infected trash has been a factor which has contributed to the spread of the disease. The persistence of the disease in the soil has been proved in Jamaica to extend to a period of at least 10 years. Bananas cannot therefore be safely planted on land where the disease has once appeared.

The exact conditions predisposing plants to this disease are not known, but it is probable that in very wet climates where there is no definite dry season, bad drainage and resulting sourness of the soil may favour the disease. In preparing land for bananas it is therefore advisable to trench before planting, and to provide ample sub-soil drainage so as to eliminate risk of stagnant water being retained in the soil. The Chinese or Cavendish banana has not so far been affected by this disease, and several other local varieties in Jamaica are known to be immune. The question of producing an immune variety for commercial purposes is now being seriously considered.

A disease of the Panama type occurs in Java where it was first observed in 1915 in the neighbourhood of Buitenzorg. The affected plants show discoloration of the vascular tissues from the roots upwards and occasionally there is wilting of the leaves, but so far, the fungus has proved of little economic significance.

Blood disease.—In Dutch Celebes this disease has caused considerable damage to bananas. The leaves and also the fruits are affected, and internally the vascular tissue shows discoloration similar to that caused by Panama disease. The most obvious symptom is the presence of yellowish-brown stripes on one or more of the younger leaves commencing at the midrib and gradually extending to the leaf margin. This may last for some time until the fruit is almost completely developed, when suddenly the whole leaf crown turns yellow and breaks down. The skin of the fruit turns yellow whilst the interior becomes filled with a slimy red fluid ; the fruit finally drops and decays. This disease is attributed to a bacterium which gains access by the roots. Young plants become affected from the mother plant and the disease is also spread by infected soil. Insects and wind are also capable of spreading the disease by dispersing the bacteria to sensitive parts of the plant, such as the stigmas of the flowers. In the absence of any remedy for this disease, the destruction of affected plants by burning is recommended.

Bunchy top or Cabbage top.—This is a disease affecting the plant the cause of which is not definitely known. It is prevalent in certain districts of Queensland and New South Wales and has also occurred in Fiji. The characteristic feature of the disease is the tendency for the leaves to remain more or less erect and close together in a bunch instead of expanding normally ; hence the common name for the disease. Both the leaf-blades and stalks become very brittle and the cap protecting the young leaf frequently breaks off, allowing rain-water to enter the centre, and this sometimes causes decay, in which case there is an offensive odour. The surest indication of the disease are dark green lines that form on the under-sides of the leaf-stalks. The fruit bunch, if it develops at all, is small and puny and the fruits turn black at he tips. The roots of affected plants are invariably unhealthy, the extremities are usually dead and sometimes the diseased portions extend to the bulb. Numerous eelworms are usually present, but it is not yet proved that these are the original cause of the trouble. It is probable that faulty soil conditions are a predisposing cause, due to bad drainage, or to the absence of some essential constituent. The control measures recommended are improved drainage, and manures containing potash and phosphates. The isolation of affected areas is now enforced in Queensland with a view to checking the spread of the disease, and a thorough investigation as to its cause is being undertaken by the Government.

Banana Heart Rot, or *Heart Leaf Rot.*—The cause of this disease, which occurs in some localities, is obscure but is probably due to a bacterium. In affected plants the terminal leaf which extends down the central "stem" decays and gives off an offensive odour. The control measures consist in cutting down the plant below the affected part and destroying it by burning. The suckers following a diseased plant are not usually attacked, but as a precautionary measure they should be sprayed with Bordeaux mixture.

Marasmius disease.—This disease, which is not usually serious, but which occasionally causes the death of plants, is produced by *Marasmius semiustus.* The mycelium of this fungus attacks the leaf-sheaths near the soil level. It penetrates the tissues of the stem of the plant and attacks the central flower-stalk. The fructifications of the fungus appear on the exterior of the stem as small toad-stools, the caps varying from ½ in. to 1 in. in diameter. The disease is favoured by moist conditions accompanied by cold weather, and usually attacks plants growing in dense grass or in badly drained, water-logged soil. It is also liable to result from the application of excessive quantities of nitrogenous manures at the base of the plant. These conditions favouring the disease can be remedied by cultural methods and by clean cultivation.

Black Spot.—This disease of the leaves is due to *Cercospora musarum,* a fungus which attacks plants in Jamaica, Fiji and elsewhere, but seldom causes serious damage. The attacks begin as tiny black spots on the main veins of the leaf-blade. These spread and become roundish blotches with a yellow border, which later turn brown and unite with others, giving rise to a broad zone of dry tissue extending round the outer half of the leaf-blade. Spraying with Bordeaux mixture is recommended to keep the disease controlled.

Banana Freckle.—The banana fruit in Hawaii and the Philippines is subject to this disease, which is attributed to *Phoma musae*, a fungus known to occur on a variety of plants. The disease causes unequal ripening of the fruits and also gives them an unsightly spotted appearance which detracts from their value and renders them unfit for export purposes. The disease could probably be controlled by the use of Bordeaux mixture.

Finger-tip Rot.—This disease of the fruit of the Chinese banana is reported from Jamaica. It is due to a fungus which attacks the remains of the flower at the tip of the fruit and causes it to rot. The remedy suggested is trimming each finger of the bunch with a knife some time before the bunch is cut, as the flower is not shed naturally in Jamaica as it is in the Canary Islands.

INSECT PESTS

Black Stem Weevil or Borer.—Amongst insect pests that attack the banana the greatest trouble appears to be caused by the " black stem weevil," or " borer " (*Cosmopolotes sordidus*). This insect, or a closely allied species, occurs in many banana-growing countries, and is particularly destructive in Fiji. It attacks the " bulbs " of the plants by burrowing, eventually making them completely hollow and spongy, and causing young plants to wither and ultimately to die. Briefly, the appearance of the weevil and different stages in its life-history are as follows: the eggs are deposited on the tissues of the banana stem just above ground ; the emerging larvæ burrow downwards and enter the bulb on which they feed, packing the tunnels they make with the gnawed tissue. The larva is a short, thick-set, wrinkled, legless, white grub, with a roundish, reddish-brown head, slightly over ½ in. in length. The pupa is dull white, ½ in. long, showing outlines of the adult insect. The adult weevil is of a uniform dull black tint thickly covered with a fine, greyish buff pubescence, except on the back and wing covers ; the whole surface is thickly and finely punctured, and the back and wing covers are marked with regular parallel lines ; it is about ½ in. long and has the prominent proboscis characteristic of weevils. It crawls over the ground to deposit its eggs and is not known to fly. In the absence of natural enemies sufficiently powerful to keep it in check, the only method of controlling the insect is by trapping. The trap consists of portions of banana bulbs placed on the ground in places where the pest is present. These pieces should be examined at frequent intervals ; and any insects found in them should be destroyed, and the pieces should be burnt and replaced by fresh pieces.

Great care should be taken in selecting bulbs for planting to see that they are free from this pest. The presence of borers may be detected by examining a small slice from the bulb ; if this shows perforations filled with sawdust-like débris it may be assumed that the larvæ of the borer are present and the bulb should accordingly be rejected. The plantations should be kept free from banana stumps, which should be removed at an early stage after harvesting as they are likely to form a harbour for the pest.

Scab Moth.—A pest causing injury to the fruit in Fiji is a small moth. The injury, known as " Scab," at first takes the form of cracks in the skin of the fruit and these later spread and become discoloured patches which sometimes extend to the edible portion of the fruit causing it to decay. The apparent cracks are caused by the removal of strips of stem, eaten away by the small, thread-like larvæ of the insects. The attacks, if slight, detract from the appearance of the fruit and lower its market value ; and if severe they render the fruit unsuitable for export. This pest may be controlled by dusting each hand of young fruit with pyrethrum powder before the bracts have opened.

NEMATODE WORMS

A nematode worm, sometimes known as eelworm or flaskworm (*Tylenchus* sp.) is a frequent pest of the " Gros

Michel " banana plant in several countries. These minute worms are present in the soil and attack the roots of the banana plant causing them to develop gall-like swellings, resulting in a diseased condition. The older leaves of affected plants become yellow and die, and the suckers of such plants have a stunted growth. This pest may be introduced in soil brought from infected areas, and it is essential when suckers are procured for planting that they should be obtained from soil free from the pest. As a measure of precaution all suckers used for planting from districts where the pest is known to occur should be disinfected by being steeped in a solution of corrosive sublimate for at least two hours, the roots having first been cut back close to the bulb and all adhering soil removed. The solution, consisting of 1 oz. of corrosive sublimate dissolved in 6 gallons of water, must be made in a wooden vessel and should be carefully protected when not in use as it is highly poisonous. The growth of affected plants should be stimulated by manuring, and the soil should be kept in good tilth to encourage roots to penetrate more deeply, as surface roots are the most liable to attack.

Subsidiary Banana Products

Although the cultivation of bananas, on a commercial scale, is chiefly concerned with the production of fresh fruit, there are several other banana products entering commerce on a small scale which are worthy of the consideration of planters, especially in new areas where facilities for the export of fresh fruit may not always be available. These products also afford a means for utilising fruit that is not of sufficiently high grade to pass inspection for export, or for employing local varieties that may suit the localities in which they are grown but are not of the kind required for export as fresh fruit. The most important of these subsidiary products are banana chips, meal or flour, which are prepared from the fully developed but unripe fruits ; and banana " figs " or evaporated bananas, for which ripe fruits are utilised.

Banana chips, meal or flour.—For the manufacture of these products the fruits are used in the green state, when they have attained full size but are still hard, that is, before the ripening process has converted the starchy contents of the fruit into sugar. In the green state the banana is difficult to peel and, therefore, in order to facilitate the removal of the skin the fruits are immersed in hot water (176° F.) for a few minutes. The peeled fruits are then cut longitudinally into two pieces or are cut transversely into a number of small pieces, or "chips." For cutting and peeling the fruit a knife made of wood, bamboo or horn must be employed, or one of stainless steel, as an ordinary steel knife is tarnished on coming in contact with the fruit and causes discoloration of the finished product. The cut pieces are spread out in the sun to dry on mats or trays of bamboo or rattan and are turned about occasionally until thoroughly dry. If the climate is unsuitable for sun-drying, vacuum or machine driers, such as are used for copra, in which a temperature of from 160° to 180° F. can be maintained, are necessary. These driers are not only quicker but they give a superior product and obviate the risk of contamination by insects or dust. When thoroughly dry the fruit sections have a white biscuit-like appearance, and can then be readily reduced to meal by pounding in a mortar or by milling. To produce flour the meal is sifted through a sieve of fine mesh to remove the coarser particles. The finished product is packed in paper-lined wooden barrels for export; but as meal does not keep well in a tropical climate it is sometimes preferable to export the dried chips to be manufactured into meal and flour in the country of importation.

Banana flour consists almost entirely of carbohydrates and differs from wheat flour in not containing gluten. It is in consequence not suitable by itself for making bread as it will not "rise," but if mixed with wheat flour in the proportion of one of banana flour to three of wheat flour it is said to make a close-textured loaf, resembling ordinary brown bread, with a decided banana flavour.

Banana flour is used in the United Kingdom and in Continental countries for making various proprietary foods for infants and invalids and also in biscuit manufacture. The demand has not hitherto been large, probably on account of the fact that regular supplies have not been forthcoming. Before the war a certain quantity was imported into Germany from the Cameroons, and the United Kingdom obtained supplies from Jamaica. It is probable that extended uses for this product could be found if regular supplies were available.

The yield of flour is approximately 20 per cent. of the weight of the green fruits, but varies considerably according to the variety of banana employed and local conditions. Prices range from 10*s.* to 15*s.* per cwt. in the United Kingdom.

Banana "figs."—For the preparation of evaporated bananas or banana " figs " the Chinese or Cavendish banana gives better results than the " Gros Michel " variety. The fully mature, ripe fruits are used ; if not sufficiently ripe the dried product will be tough, whilst if too ripe it will be sticky and dark in colour. The precise stage of ripeness for drying to produce a satisfactory article is therefore a matter which requires some judgment. The peeling of ripe fruits presents no difficulties. The peeled fruit may be dried whole, or after being split into two pieces longitudinally or into small disc-like slices by cutting transversely. As in the preparation of " chips," an ordinary steel knife must not be used for cutting up the fruit, but one of stainless steel may be employed, or knives made from bamboo, wood or horn. The fruit prepared for drying should be spread on trays of bamboo or rattan, or of cotton cloth stretched on wooden frames, but should not be allowed to come in contact with steel or iron. If the climate permits of rapid drying by exposure to the sun the " figs " can be prepared by this process, but a quicker and more effective method is to employ a vacuum or machine drier for the work. The finished product, if well prepared, should be of a light yellowish-brown colour, but if the fruits are too ripe or the drying is too slow they are liable to assume a dark brown colour and are then not so attractive. The sugar contained in the ripe fruits is brought to the surface on drying, and, except in the case of certain kinds now being prepared by improved methods, the dried fruits present a sticky appearance which does not add to their attractiveness. Probably the most attractive method of preparing the dried fruit for use as a sweet-meat would be to cut the fruit into disc-like slices and coat the slices with sugar during the drying process. This would result in a " crystallised " product similar in appearance to crystallised ginger which is in constant demand and finds a ready sale with confectioners. The addition of sugar would, however, render the product liable to excise duty in the United Kingdom. The appearance of the dried whole fruits might possibly be improved by a light dusting with banana flour before packing. For export purposes dried bananas are usually packed in wooden boxes, like dates. If a paper lining is used it should be of waxed paper, as ordinary paper would adhere to the fruit. For retail purposes the fruit is usually repacked in cartons similar to those used for the better kinds of dates and figs. There appears to be no reason why dried bananas should not become as popular as Turkish figs or dates but hitherto the demand for them has been limited. It is probable that in countries where they have to compete with the fresh fruit the demand will never be great, unless confectioners and manufacturers of chutnies and sweet pickles can be induced to utilise them in their various preparations. In countries where the fresh fruit is not procurable they should find a good market, especially if an improved appearance could be given to them.

The principal country producing banana " figs " is Jamaica, where several factories are engaged in their preparation. The quantity annually exported fluctuates considerably according to the demand for fresh fruit and the amount of fruit available. The following table shows the quantities and values of the Jamaica banana " figs " exported during the past ten years :

Year.	*Packages.*	*Value £.*
1914	2,576	1,858
1915	789	831
1916	1,012	776
1917	1,154	570
1918	6,526	6,680
1919	19,937	25,433
1920	7,670	11,774
1921	—	5,109
1922	3,802	3,334
1923 (Jan.–Sept.)	2,257	1,533

The comparative ease with which dried bananas can be exported as compared with the fresh fruit should render this form attractive to the small grower, especially in places where shipping facilities for the export of fresh fruit are not available. The large growers might also give this product more attention as there is considerable waste of fruit at ports where bananas are shipped owing to unsuitable fruit being rejected. If the co-operation of confectioners and manufacturers could be obtained, and a regular supply of carefully prepared banana figs or slices of an attractive appearance could be assured, a much larger output could probably be absorbed.

Banana fibre.—The stems of bananas which have fruited are cut down after the fruit has been harvested and, with the leaves, form what is known as banana " trash." Large quantities of trash are available in countries where the acreage of bananas is large and it is usual to return this to the soil of the plantations as manure. In cases where the fresh fruit is exported in crates, a certain amount of leaf trash is used as packing, but this is relatively small. As the stems contain a fibre, proposals have from time to time been made for extracting it for use as a cordage fibre, and small quantities have been obtained for local use but not on a commercial scale. It is found that the fibre obtained from plants which have fruited is inferior in quality to that obtained from wild bananas or from the allied species, *Musa textilis*, which furnishes manila hemp. Experiments carried out in Jamaica showed that the yield of fibre from stems of fruiting bananas was only 1·44 per cent., so that unless prices for fibres of this class ruled very high it would hardly pay for the labour involved in collecting the stems and extracting the fibre.

Proposals have also been made for utilising banana stems for paper pulp and this would appear feasible in countries where large areas are under bananas, but in view of the low yield of pulp the returns would be small. In order to obtain 1 ton of paper it is estimated that it would be necessary to handle 132 tons of the cut stems, and the resulting paper would not be of very high quality.

A British patent has recently been granted covering a process for the manufacture of cellulose pulp from banana trash by non-chemical means. By this process the trash is crushed between rollers which reduce the moisture content from about 90 per cent. to 55–75 per cent. The liquid being removed, the remaining trash is reduced to pulp in a pulping machine, and is afterwards cooked for from 3 to 6 hours in a boiler under pressure. It is afterwards transferred to a breaking and beating machine where it is washed and the gummy substances removed in a current of water. The recovery of the cellulose completes the process and it is claimed that the resulting product is stronger and of lighter colour than if soda had been employed.

Potash.—It has been shown that the ashes of banana stalks and skins contain respectively 45·9 and 57·16 per cent. of potash, equivalent to 1·14 and 1·05 per cent. in the fresh stalks and 13·75 and 9·03 per cent. in the dried material. Dried banana stalks are thus as rich in potash as commercial kainit and they are therefore of considerable value as manure. The stalks and trash used for packing should therefore be returned to the banana plantations, or, if this is not possible in areas where wilt disease is present, they should be burnt and the ashes returned to the soil.

Banana Cultivation in the Empire

The following is a brief summary of the present position of banana cultivation in countries of the Empire. In most of the tropical regions the banana is grown as a food crop for local consumption. The question as to whether the cultivation could be extended in these countries so as to provide a surplus for export depends upon there being suitable land available near a port, together with the necessary labour supply and shipping facilities with cold-storage accommodation for exporting the produce. The possibility of commencing an industry in banana flour or dried bananas, where facilities for exporting the fresh fruit are not available, should not be overlooked.

British West Indies.—Jamaica is now the centre of the West Indian banana trade and is also the principal banana-exporting country in the world. The best soil for bananas is found in the Portland and St. Mary parishes where enormous crops are produced. On the plains of St.

Catherine and in Vere the crop is grown under irrigation. The trade in Jamaica has prospered during recent years owing to the Panama disease in Central America having checked the supply from those countries which produce the bulk of the world's output. This disease is present in Jamaica but is controlled by the strict system of inspection and quarantine which has been in force during the past ten years. The export of the fresh fruit from Jamaica in the year 1923 was 12,455,310 bunches, valued at £2,265,309 ; the export has on several occasions exceeded 16 million bunches a year, but the value has never previously reached £2,000,000. For the last 22 years the average export has been 11,104,866 bunches and the average value £1,001,460 or 1*s.* 8*d.* per bunch, whilst in 1923 the price per bunch reached an average of 3*s.* 6*d.*

The success of the banana industry in Jamaica is largely due to the part played by the United Fruit Company, the Atlantic Fruit Company, and the Jamaica Fruit and Shipping Company, especially the first-named, which operates on a very large scale. The bulk of the trade is with the United States and Canada, but a considerable amount of business is done with the United Kingdom and the Continent of Europe by Messrs. Elders & Fyffes, Ltd., a British Company managed in England, but in which the majority of the shares are held by the United Fruit Company.

In addition to the fresh fruit there is a small trade done in banana meal and a considerable trade in dried bananas. There was an export of 20,000 boxes of the latter, valued at £25,000, in 1919–20, but, owing to a shortage of fruit, the export for 1921 fell to 8,000 boxes. This trade utilises low-grade bananas that are not accepted for export as fresh fruit or that are produced at some distance from the shipping port.

Bananas were formerly exported on a small scale from Trinidad and also from Barbados and Dominica, but this trade has now almost ceased. Recently a proposal was made by a syndicate of British capitalists to create a banana export industry in Dominica. Owing to the difficulties of internal transport in this island it was not found possible to export the fruit at the prices offered by the syndicate and the proposal did not materialise. As a result of the enquiry, a small demonstration plot of 200 plants, spaced 12 × 12 ft. in rows 16 ft. apart, has been established to illustrate improved methods of cultivation in case the subject of a banana industry should be reopened in the future.

British Honduras.—The banana trade of British Honduras is but a minute part of the great Central American and Jamaican industry developed by the United Fruit Company. The output of bananas in British Honduras is relatively small, being less than 500,000 bunches a year. The fruit is grown principally at Stann Creek Valley, Riversdale and Monkey River ; and the coasting steamers of the United Fruit Company call weekly on a fixed schedule to take the produce to New Orleans. The banana industry in the Stann Creek Valley is rapidly declining, chiefly on account of Panama disease. The Government have taken steps to prevent the spread of the disease from the Stann Creek Valley, and with strict quarantine and sound methods of production it should be possible to continue banana growing on suitable new lands in areas like Monkey River and Sittee River, where the disease has not yet shown itself. The prices paid for fruit are low compared with those paid in Jamaica ; nevertheless, these prices bring in a profit to the small grower, provided he can secure land of high productive value, free from disease. The quality of the fruit in British Honduras is quite satisfactory, though the yield per acre is not so large as in Jamaica, Guatemala and Costa Rica. But if trenching and mulching were practised, it could easily be made so ; this consideration, however, depends upon labour supply and the prices paid for fruit. The banana plantations in British Honduras are sometimes liable to damage by floods, blowdowns and cold weather ; but these are not so disastrous as hurricanes.

British Guiana.—The flavour of the local bananas, of which there are several varieties, compares favourably with that of those exported from other places, and at one time it was thought that an export trade might be built up. The local banana is said, however, to be too delicate to stand transport. Other varieties, such as the "Gros

Michel," can be grown, however, on warm, well-drained lands, rich in humus. If, therefore, facilities for transport to a shipping point were available and the present lack of labour could be overcome, something might be done towards developing an industry.

Australia.—The cultivation of bananas in Australia, as a commercial proposition, is now carried on chiefly in Queensland, but, owing to the attention that has been recently given to sugar, large areas that were formerly planted with bananas have now been devoted to the latter crop. In the Tweed River district of the North Coast Division of New South Wales the banana is also grown as a commercial crop, but " bunchy top " disease has checked development in recent years. According to the *Yearbook of the Commonwealth of Australia for* 1923 the following are the banana areas and yields for the fiscal year 1921–22 :

	New South Wales	Queensland.	Western Australia.	Commonwealth of Australia.
Area (*acres*) . .	4,570	9,873	7	14,450
Yield (*bushels*) . .	650,300	1,307,090	785	1,958,175
Value £ . . .	368,500	363,080	1,178	732,758

With the extension of the main coastal railway to Cairns, which is shortly to be completed, very large areas of land that are admirably adapted for the culture of bananas will be made available, and in all probability there will be an extension of the areas under bananas in Northern Queensland. The Mackay district has been favourably reported on by the Queensland Director of Fruit Culture in this connection. The proposed railway would permit of bananas being landed in Sydney with only one handling at the border. Bananas are said to yield a profit in Queensland of from £20 to £50 an acre from the third year's crop. The import duty of 1*d.* per lb. on bananas entering the Commonwealth, imposed in 1921, should stimulate the production of the home-grown fruit. The following table shows the quantities and values of the bananas imported into Australia during the two fiscal years 1920–21 and 1921–22 :

	1920–21.		1921–22.	
From	Quantity (*centals*).	Value £	Quantity (*centals*).	Value £
Fiji	88,676	84,649	2	2
Netherlands East Indies .	16,456	14,146	18,292	20,610
Other countries . .	504	370	317	185
Total	105,636	99,165	18,611	20,797

Fiji.—The cultivation of bananas for export as green fruit to New Zealand is a considerable industry; large quantities were also formerly exported to Australia. The fruit is grown by Europeans, and by small cultivators, both Indian and Fijian, who sell their fruit to exporters. The large grower may ship his own fruit, but sometimes he sells to the exporter.

The fruit is cut and shipped green, and is subject to inspection during the loading into the steamer, in accordance with regulations, made under the Fruit Export Ordinance, which, among other things, require that it shall be of a certain quality, shall not have been cut more than a specified number of days before shipment, and that the plants from which it was cut have been treated according to the regulations in force for the time being under the Diseases of Plants Ordinance.

The chief banana areas on Vitilevu are on the Rewa River; the Tailevu coast; on small creeks around Suva, and between that port and Navua; and on the Navua River and the Sigatoka River. A small quantity of fruit is grown on the South Coast of Vanualevu, and around Levuka on Ovalau.

Suva is now the only port of shipment, and the fruit for export must therefore be grown within reasonable distance of that port. Levuka, Momi and Savusavu Bay were also used formerly when fruit was plentiful in those neighbourhoods.

At present new shippers can only be given space in the exporting steamer at the expense of existing shippers, and the industry is therefore only capable of limited expansion. Whilst very remunerative under certain conditions, the industry is surrounded by risks, and can only be embarked on with a good chance of immediate success by persons with much local experience.

The export for 1921 amounted to 582,925 bunches, valued at £73,600, of which New Zealand took 485,129 bunches and Australia 97,796. The export for 1922 amounted to 358,122 bunches, valued at £45,717, of which 354,215 bunches went to New Zealand and 3,895 to Canada. The import duty has now practically stopped the export to Australia. The trial shipment to Canada was not satisfactory owing to the unsuitability of the steamer, but with suitable shipping there is a possibility of a satisfactory trade with that country. The imports of fresh bananas into Canada during the 4 years ending with 1922 were as follows :

	1919.	1920.	1921.	1922.
Total bunches . .	1,665,414	1,844,559	1,706,288	2,159,860
Total value . . .	$3,716,713	4,947,007	5,415,511	5,211,098

Practically the whole of these imports were obtained through the United States of America, and in addition there was a small import of dried bananas from Jamaica. It will be seen, therefore, that a considerable market exists in Canada for bananas which might be secured by Fiji exporters.

British Solomon Islands Protectorate.—Bananas have been exported from the islands to the Australian markets and have commanded prices equal to those obtained for the best Fiji fruit. "Gros Michel" bananas from the Solomons have been pronounced by a Fiji expert to be equal to anything that Fiji can produce. The "Cavendish" banana is grown in abundance in native gardens.

Malaya.—The banana can be produced so cheaply in this country that it should be possible to ship fresh fruit to the Southern and Western States of Australia ; and, provided ships on the Singapore-Australian route were fitted with special refrigerating space, there appears to be no reason why a profitable trade should not be developed between the two countries. The fruits can be purchased in the local markets at considerably less than a cent each and, if delivered in good condition, could probably be sold in Australia at a price equivalent to 5 to 6 cents.

Ceylon and India.—Bananas are a subsidiary crop in opening up land for coconuts in the North-West Province of Ceylon, whilst in parts of the Kegalle and Dumbara districts they form the chief native cultivation. Several local varieties are grown, including "Gros Michel" and "Cavendish," but the production is only equal to the local demand and there is no export.

In India the cultivation is general all over the country except at high elevations, and bananas are an important factor in the food supply of the people. The crop is consumed locally and there is no export.

Cyprus.—Bananas are grown as a garden crop and the cultivation will probably extend. Special varieties have been introduced by the Agricultural Department and have been distributed to growers.

Kenya.—Bananas are grown to great perfection over most of the Colony, being largely cultivated by the Africans, and with some tribes the fruit forms an important part of their food supply. Some of the finer flavoured varieties are grown to some extent by the European farmers, and bananas always find a ready local market, though scarcely on a sufficiently remunerative scale to warrant their being planted more extensively until export and a foreign market can be arranged for.

South Africa.—In the Union of South Africa bananas are commonly grown as ornamental plants. In Natal they are also grown on a commercial scale for fruit, although not extensively, the total production barely meeting home requirements. There is a small export of an annual average value of about £500 a year, but in 1922 this reached a value of £800.

West Africa.—In view of the favourable situation of the West African Colonies as regards nearness to the home market, the possibility of developing a banana industry in this region would appear to be worthy of serious consideration, especially in view of the check to the production of bananas in Central America which has resulted from the spread of the Panama disease. The French have established a small industry in French Guinea which exports fresh fruit on a small scale to France, and before the war the Germans had devoted a good deal of attention to establishing a banana industry in the Cameroons and had commenced to export fruit to Germany. No attempts appear to have been made to export bananas from any of the British West African Colonies, although bananas are generally grown for local use, and this is probably due to the overwhelming importance of oil-palm products and cocoa in these countries. In view of the competition in oil-palm products which will no doubt soon result from the cultivation of the oil-palm in the East and the declining prices

Plate VIII.—A Crop of Bananas arriving at the Estate Railway, Tiko, Cameroons.

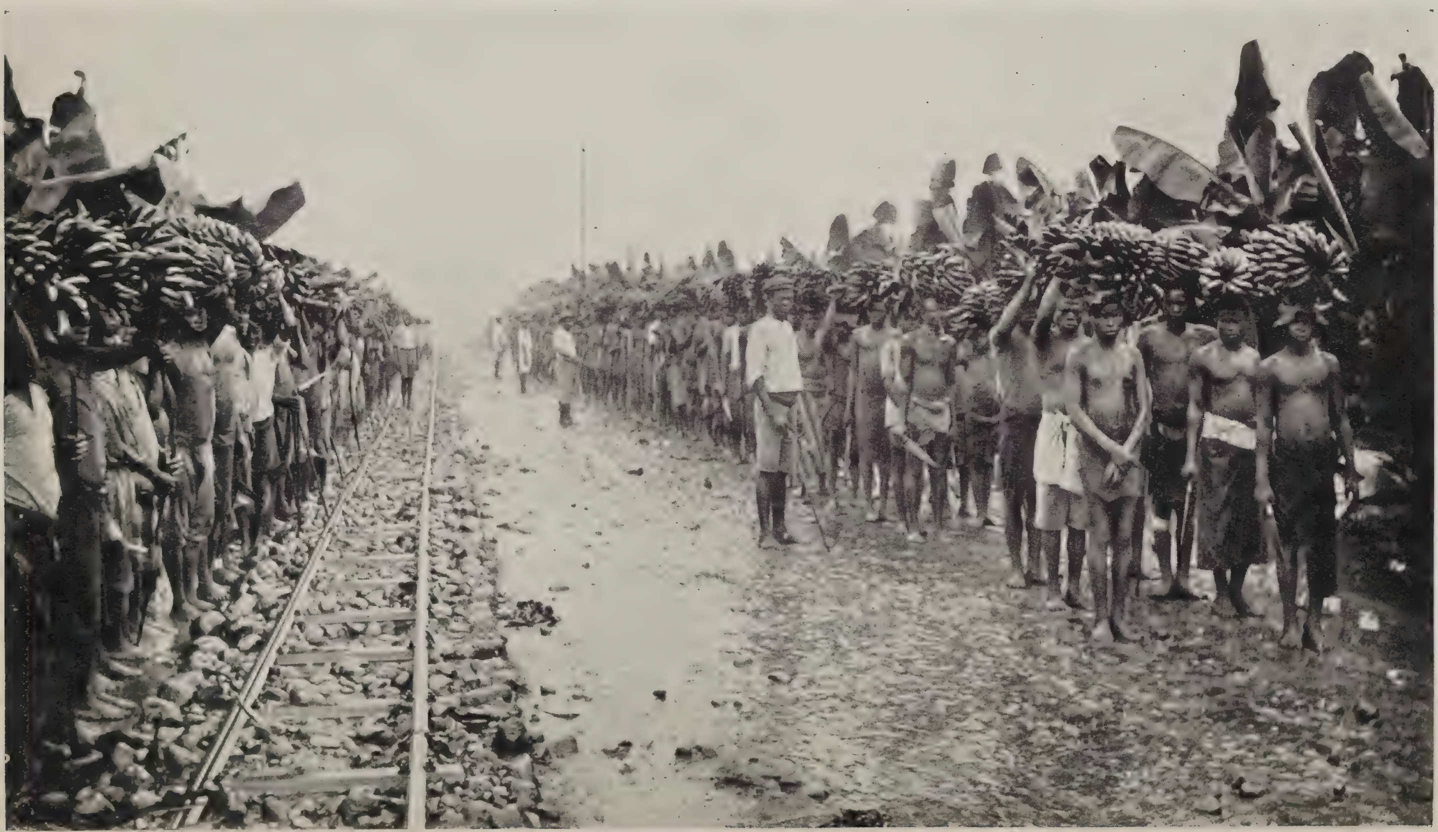

Photo by F. Evans, Supervisor of Plantations, Cameroons.

for cocoa, the consideration of the banana as a possible subsidiary export crop would appear to be desirable.

THE BRITISH SOLOMON ISLANDS

The Solomon Islands Protectorate, though one of the less known parts of the British Empire, is by no means among the least attractive or from a historical point of view the least romantic. The Islands have assumed some importance in recent years, owing to the extension of coconut cultivation for the preparation and export of copra, but as will be shown in this article they are also of much interest in other ways.

Several writers have dealt with various aspects of the Islands, and an excellent general description of the region was given nearly thirty years ago by Mr. H. B. Guppy, M.B., F.G.S., in his work *The Solomon Islands and Their Natives*. The present article is based largely on Mr. Guppy's observations and on the information furnished in the official *Handbook of the British Solomon Islands Protectorate*, a new edition of which was recently issued at Suva, Fiji.

I. Historical and General

Mr. Guppy's work affords much interesting information on the geology, botany, meteorology and other natural features of the Islands. The author also discusses the native population at considerable length, and he suggests that the earliest inhabitants were of the same stock as the present natives of the Andaman Islands and certain other parts of the East Indies, on which supposition he observes that the physical and linguistic characters of this race have since become fused with those of other peoples who reached the Islands from Malaya, Micronesia and Polynesia. This aspect of the question is, however, largely a matter of speculation, and for the present purpose the history of the Solomons commences in 1568, when the Spanish explorer Alvaro de Mendana, who had sailed from Peru with the object of discovering a southern continent, visited several of the islands in the group and gave them Spanish names which they still bear. Nearly thirty years later he again sailed from Peru, this time with a commission to colonise the islands, but he failed to locate the Solomons proper, and endeavoured to form a settlement (named by him Graciosa Bay) on the largest island of the Santa Cruz Group, which now forms part of the British Protectorate. Mendana and others of his party shortly afterwards died, and it was found impossible to carry the colonisation to a successful issue ; the survivors accordingly re-embarked, under the command of Pedro Fernandez de Quiros, and sailed westward with the intention of reaching San Cristoval, the nearest large island of the main group. For some reason—probably a mistake in reckoning, coupled with bad atmospheric conditions—they could not find it, and were compelled to change their course and proceed to Manila.

This failure to find San Cristoval had a remarkable sequel, for though Quiros subsequently made new discoveries in the southern Pacific (including the island of Espiritu Santo in the New Hebrides) and other explorers visited outlying parts of the present Protectorate in the following century, the Solomon Islands proper were relegated to obscurity for nearly two centuries, and their very existence became a matter of doubt. The rediscovery of the group was carried out in 1767–69 by Carteret, de Bougainville and de Surville. Further exploration of the region followed in 1781 and 1788 under Spanish and British auspices, and subsequently numerous individual islands were found and named by various navigators. The islands continued to be the scene of exploration and adventure up to the end of the nineteenth century.

The particulars quoted above explain the variety of languages met with in the European names of the islands. In the year 1893 a British Protectorate was declared over the islands of the Southern Solomons—comprising Guadalcanal, Savo, Malaita (or Mala), San Cristoval (or Bauro), and the New Georgia Group with its dependencies—and also over the Island of Treasury at the southern entrance of the Bougainville Straits ; whilst Ysabel, Choiseul, the islands in Bougainville Straits, and the island of Bougain-

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